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July 1, 2016

VIA EMAIL

Ms. Cynthia J. Morris
Ms. Chloe H. Kolman
Environment & Natural
Resources Division
Env. Defense Section
P.O. Box 7611
Washington, D.C. 20044

Nina Rivera, Esquire
Office of Regional Counsel
U.S. Environmental Protection
Agency
1650 Arch Street; Region 3
Philadelphia, PA 19103

Daniel Mulvihill, Esquire
Senior Attorney
Delaware Riverkeeper Network
925 Canal Street
7th Floor, Suite 3701
Bristol PA 19007

Re: Status Report No. 5

Dear Ms. Morris, Ms. Kolman, Ms. Rivera, and Mr. Mulvihill:

Pursuant to paragraph B.3 of the Interim Settlement Agreement between the West Goshen Sewer Authority ("the Authority"), the United States Environmental Protection Agency, and the Delaware Riverkeeper Network, the Authority provides the representatives of the parties with the attached semi-annual status report regarding the Authority's efforts to make interim reductions in its discharge of phosphorus to Goose Creek.

Please let me know if you have any questions.

Yours truly,

Steven T. Miano

STM/cas
Cc: Ross A. Unruh, Esquire

WEST GOSHEN SEWER AUTHORITY
CHESTER COUNTY, PENNSYLVANIA

Status Report No. 5
July 1, 2016

This is a status report on the efforts completed by the West Goshen Sewer Authority (Authority) from January 2016 through June 2016 to evaluate interim reduction in total phosphorus (TP) discharged to Goose Creek as part of the Interim Settlement Agreement (Agreement) with the Environmental Protection Agency (EPA) and the Delaware Riverkeeper Network (DRN).

I. Previous Efforts and Capital Improvement Plan

An evaluation of the existing wastewater treatment plant (WWTP) was completed in the fall of 2015. This evaluation was used to further develop and define the Capital Improvement Plan (CIP) to assist in determining what improvements to infrastructure components the Authority believes will result in an effluent TP discharge level of 0.8 mg/L (monthly average) within the Agreement's five-year timeframe (by January 3, 2019).

The following tasks were performed to assess the potential to improve the TP removal performance of the WWTP:

- Compare the effluent TP concentrations to the current chemical feed rates and observe any trends that may be occurring that are resulting in an increase in the effluent TP concentrations. Adjust chemical feed rates accordingly in order to improve chemical TP removal.

- Conduct jar testing during the major seasonal changes (spring and fall) at the WWTP to develop specific chemical feed dosing curves to assess optimizing the chemical feed rates and dosages.

- Provide training opportunities to the WWTP's Staff on topics related to biological and chemical nutrient removal strategies to help ensure the staff has the knowledge to make the necessary process decisions to optimize these systems during swings in process conditions.

- Monitor the return streams from the solids handling system and develop an understanding of how recycling this stream back to the head of the plant affects the TP loading on the biological system as well as its impact on the performance of the chemical treatment.
- Monitor sludge levels in the Secondary and Polishing Clarifiers as high sludge blankets from inconsistent sludge removal can result in phosphorus release.

- Confirm what process controls are used to adjust the current chemical feed rates and establish standard operating procedures (SOP's).

The CIP also recommended preparation of a WWTP process model to assist the Authority and Township Staff in the evaluation of TP strategies based on present worth cost's analysis, sustainability, environmental stewardship, and operations flexibility.

In addition to assessing the various treatment technologies available for TP removal, the present and potential future locations of these systems within the WWTP were also addressed, as they represent a major variable on the overall TP removal performance. Selecting a location to implement these technologies is also dictated by the type of existing treatment processes available and the level of TP removal required.

The WWTP currently relies on chemical addition and biological uptake processes to provide TP removal. The current treatment processes requires the addition of four (4) chemicals added at separate dosing locations in order to achieve compliance with the existing 2.0 mg/L TP effluent nutrient permit limit. The addition of these chemicals affects both the biological and chemical processes necessary for TP removal. The existing chemical dosing locations are labeled as numbers 1 through 4 on Figure 1-1 and are in summarized in Table 1-1 below.

Table 1-1 Existing Chemical Dosing Points

Dosing Point	Chemical	Notes
1	Sodium Bicarbonate	Added only as needed for pH adjustment
2	Poly-Aluminum Chloride (PAC)	April through October
3	Lime	Added only as needed for pH adjustment
4	Polymer	Added only when dewatering sludge

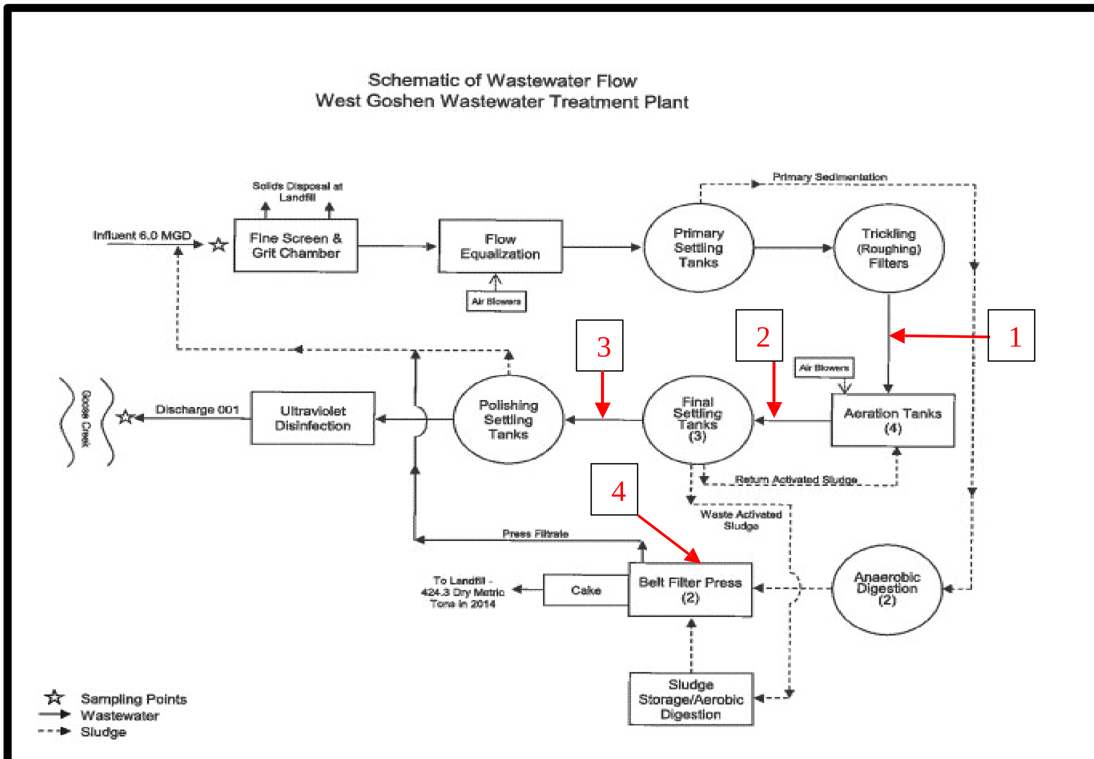

Figure 1-1 West Goshen WWTP Chemical Addition Points

Based on TP effluent data, this treatment approach has been adequate in achieving the current TP effluent limit (2.0 mg/L). However, the WWTP experienced a pH drop below 6.0 in its effluent when additional

PAC/polymer blend was added to dosing point No.3 during a pilot trial (July 20 through July 23, 2015) in an attempt to further reduce TP effluent levels.

II. Work Completed the Past Six (6) Months

1. The WWTP's Staff and Engineer have visited the following treatment facilities to review treatment technologies, speak with operators on treatment technologies, and identify potential equipment and/or operations changes that could result in improved performance of the West Goshen WWTP. In particular, the visits focused on solids handling and dewatering:

Lititz Borough Lancaster County, PA Design ADF – 3.85 MGD	5-stage Bardenpho BNR process	MTAD Solids Handling System with Centrifuge dewatering and sludge dryer
Bellefonte Borough Centre County, PA Design ADF – 3.2 MGD	Denitrification Filter with Chemical Phosphorous Removal	PAD-M Solids Handling System

2. The WWTP Staff continued to test, monitor, and record phosphorus levels at the WWTP. Please refer to Attachment A for additional testing required for calibration of the computer model described below and refer to Attachment B for TP effluent results over the past six (6) months as reported in the Daily Monitoring Reports (DMR).

3. The Authority commissioned the construction of a comprehensive computer model to further review the effects of the chemical addition on the WWTP performance and its ability to meet lower phosphorous limits while meeting current NPDES limits for other constituents (*e.g.*, pH). This was undertaken to provide a comprehensive review of the chemical addition strategy, including various simulations to refine the strategy without physically adding chemicals given the demonstrated effect on the effluent pH.

   The comprehensive model is being completed using BioWin© wastewater process simulation software from EnviroSim Associated Ltd. The comprehensive model is being used to simulate the effects of the additional chemical addition, the impact to pH, and the impacts to other unit processes. It will also be used to complete an alternatives' evaluation for the various TP treatment technologies discussed below.

   A critical component of the model development is completion of sampling at the WWTP that is used to calibrate the model to effectively evaluate the effects of the chemical addition and the identified alternatives for TP removal. The WWTP's Staff completed a comprehensive sampling program over a seven-day period beginning on March 6, 2016 and concluded on March 12, 2016. This sampling included collecting samples between each of the unit processes and testing for various constituents. The sampling locations, as well as the testing parameters and results are included in Attachment A.

   The completed sampling data was received in April 2016 at which time the data was used to complete the calibration of the process model.

An overview of the process simulation for the WWTP and the calibrated results are shown below in Figure 1-2:

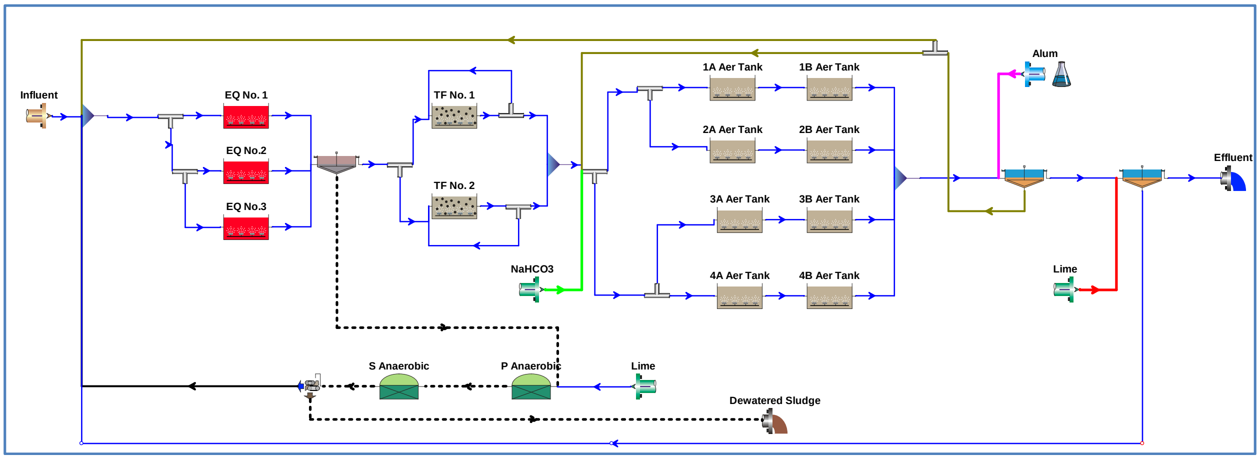

Figure 1-2: BioWin© Model of West Goshen WWTP

This calibrated model is currently being used to simulate and evaluate the effects of the following major alternatives to try to achieve an average effluent concentration of 0.8 mg/L TP while continuing to meet the effluent limits in place for other constituents.

Alternative 1- Enhanced Chemical Addition

Alternative 1 includes an evaluation of enhanced chemical addition by adding the PAC/polymer blend to the second injection location between the Secondary and Polishing Clarifiers where initial results were successful. This alternative will also include chemical addition for pH adjustment prior to disinfection and a control/automation system to control the chemical dosing for optimum performance. Multiple chemicals and injection points are being simulated to identify the best locations that have the least impact on total WWTP performance. The simulated chemical usage will be used as a starting point for implementation of a pilot program.

Alternative 2 – Biological Phosphorus Removal

Alternative 2 will include the addition of anaerobic selector(s) prior to the existing aeration tanks to facilitate the environment necessary for phosphorus accumulating organisms (PAOs) to release phosphates. The elimination of the existing trickling filters will be evaluated as a component of this alternative to increase the BOD present in the anaerobic tank(s) required for the PAOs to release phosphates (maintain target BOD: P ratio greater than 40). The dissolved oxygen (DO) in the aeration basins will be modeled in zones to ensure that adequate DO is available for the uptake of the released phosphorus. The aeration tanks will also be modeled to evaluate the feasibility of denitrification within the existing basins. Although denitrification is not necessary to meet the proposed effluent limits, it will increase alkalinity and will reduce nitrates in the return activated sludge (RAS) to prevent nitrate poisoning of the PAOs (when RAS nitrate levels are greater than 10 mg/L).

Undesirable phosphorus release in the digestion and dewatering processes will be evaluated and considered as a component to this alternative. A separate solids handling study is being completed by the Authority to evaluate alternatives for improved digestion and dewatering

Alternative 3 – Combination of Biological Phosphorus Removal and Enhanced Chemical Addition

Alternative 3 includes a combination of both Alternative 1 and 2 as a means to provide redundancy and increased cost effectiveness (balance of capital costs and operations cost) for enhanced TP removal.

Alternative 4 – Side Stream Treatment

Alternative 4 includes a side stream treatment system that is commercially available. The sidestream treatment system that will be initially evaluated and included in Alternative 4 is the Quick Wash™ nutrient recovery system from Renewable Nutrients LLC. Quick Wash™ is a side stream process that is capable of extracting and recovering up to 95% of phosphorus from the combined primary/waste activated sludge thereby reducing the amount phosphorous reintroduced into the system via the return stream. Figure 1-2 shows the location of the Quick Wash™ treatment system in the process flow of a conventional WWTP.

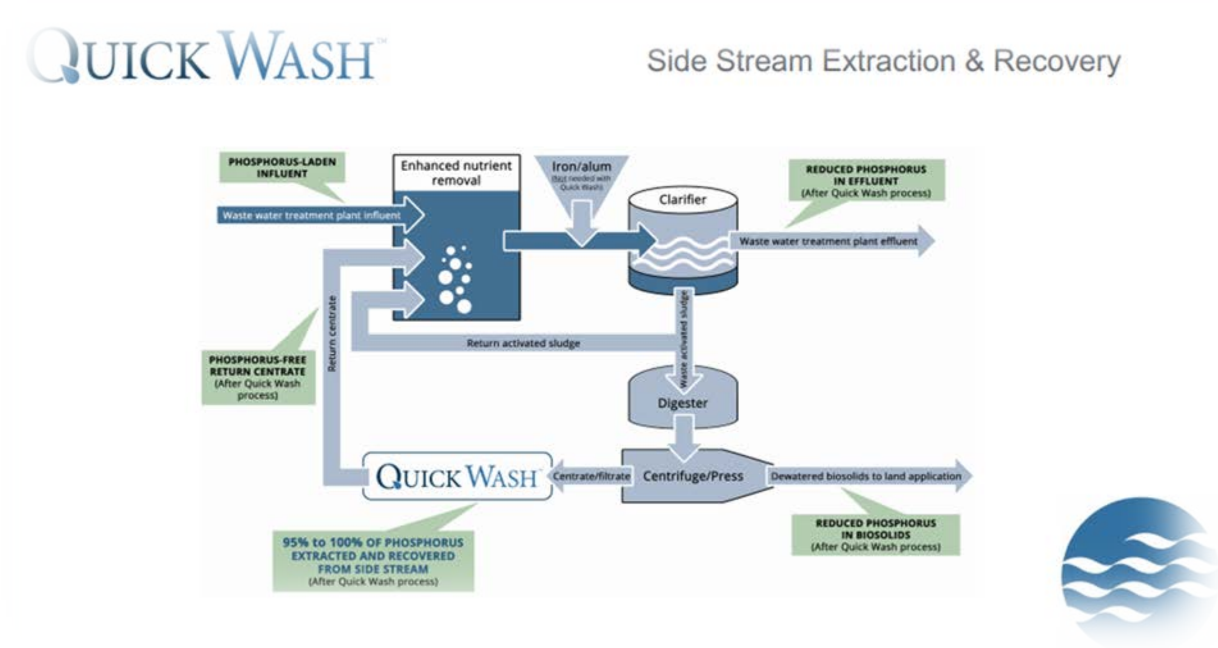

Figure 1-3: Quick Wash™ Side Stream Extraction and Recovery

An added benefit of the Quick Wash™ nutrient recovery system is that the phosphorus is physically removed from the sludge instead of simply being landfilled with the sludge. The phosphorus can then be recycled and reused as fertilizer.

4. The Authority has decided to reconsider evaluating the possibility of replacing the current dewatering system as part of the interim phosphorous reduction. This is because the Authority is currently evaluating alternatives for the existing anaerobic digesters and the possible replacement with a mechanically thickened aerobic digester system, apart from the work needed to meet the

interim phosphorous reductions. Moreover, the operation of the dewatering system will not meaningfully affect the interim phosphorous discharge levels.

III. Work Planned for the next Six (6) Months

The Authority plans to complete the following work over the next six (6) months:

1. Complete additional sampling and testing at the WWTP in order to further calibrate the existing process model, in order to further assess the overall mass balance of the WWTP. This additional sampling will assist in the evaluation of alternatives for improved solids handling. Further sampling and testing will include:
    a. Primary sludge TSS, volatile suspended solids (VSS), Flows, Temperature
    b. WAS TSS, VSS, Flows, Temperature
    c. Polishing Clarifiers' underflow sludge TSS, VSS, Flows, Temperature
    d. Feed from Secondary Digester into BFP; sludge TSS, VSS, Flows, Temperature
    e. Volatile solids reduction (VSR) performance data for the anaerobic digesters
    f. Dewatered sludge cake data; daily average wet tons, TSS, and VSS

2. Complete WWTP's process model and evaluation of TP removal alternatives described above. We currently anticipate having the alternatives evaluation completed in August 2016.

3. Begin pilot test of the recommended alternative(s) based on completion of the alternatives simulated in the process model. The pilot test results will then be compared to published data as part of this alternatives evaluation to refine the recommended alternative for implementation.

IV. Conclusion

The Authority has conducted extensive work over the past six months in order to continue to address methods it believes will achieve the TP effluent limit of 0.8 mg/L within the Agreement's five-year timeframe. Over the next six months, the Authority will continue its efforts, including the selection of the treatment alternative it believes will achieve the target TP effluent limit.

ATTACHMENT A
WWTP SAMPLING PLAN

WEST GOSHEN WWTP SAMPLING PLAN FOR MODEL CALIBRATION

SAMPLE LOCATIONS

1. Raw Wastewater (composite) – There are two separate lines for raw wastewater to enter the WWTP. They both come in at the bottom of the headworks screw pumps area. Unfortunately, the BFP filtrate and all WAS also is included in one of those lines. West Goshen has always included a note in the Chapter 94 report that these were included in the organic loading. Seven days of 24-hour composite samples were obtained using a composite sampler from the regular influent sample location at the Headworks Building. These samples were analyzed for TSS, VSS, Alkalinity, Temperature, pH, COD, Filtered COD, Flocculated and Filtered COD, cBOD, Filtered cBOD, TKN, Filtered TKN, NH3-N, NO2-N, NO3-N, Ortho-P, Soluble Ortho-P, Total-P, Calcium and Magnesium. Due to problems with the influent flow meter, the effluent flow meter reading was used for WWTP flows.

2. Equalization Tank Effluent (composite) – Seven days of 24-hour composite samples were obtained using a composite sampler from the primary clarifier distribution box. These samples were analyzed for TSS, VSS, Alkalinity, pH, COD, Filtered COD, cBOD, Filtered cBOD, TKN, Filtered TKN, NH3-N, NO2-N, NO3-N, Ortho-P, Soluble Ortho-P, Total-P, and D.O.

3. Primary Clarifier Effluent (composite) – Seven days of 24-hour composite samples were obtained using a composite sampler from the trickling filter distribution box. These samples were analyzed for TSS, VSS, Alkalinity, pH, COD, Filtered COD, cBOD, Filtered cBOD, TKN, Filtered TKN, NH3-N, NO2-N, NO3-N, Ortho-P, Soluble Ortho-P, and Total-P.

4. Trickling Filter Effluent (composite) – Seven days of 24-hour composite samples were obtained using a composite sampler from the intermediate pumping station wet well. These samples were analyzed for TSS, VSS, Alkalinity, pH, COD, Filtered COD, cBOD, Filtered cBOD, TKN, Filtered TKN, NH3-N, NO2-N, NO3-N, Ortho-P, Soluble Ortho-P, and Total-P.

5. Aeration Tank Effluent (composite) – Seven days of 24-hour composite samples were obtained using a composite sampler from the secondary clarifier distribution box. These samples were analyzed for TSS, VSS, Alkalinity, pH, COD, Filtered COD, cBOD, Filtered cBOD, TKN, Filtered TKN, NH3-N, NO2-N, NO3-N, Ortho-P, Soluble Ortho-P, Total-P, D.O., and Temperature.

6. Secondary Clarifier Effluent (composite) – – Seven days of 24-hour composite samples were obtained using a composite sampler from the polishing clarifier distribution box. These samples were analyzed for TSS, VSS, Alkalinity, COD, Filtered COD, cBOD, Filtered cBOD, TKN, Filtered TKN, NH3-N, NO2-N, NO3-N, Ortho-P, Soluble Ortho-P, Total-P, and Temperature.

7. Polishing Clarifier Effluent (composite) – Seven days of 24-hour composite samples were obtained using the existing effluent sampler located at the end of the UV disinfection channel just before the effluent enters the outfall line. These samples were analyzed for TSS, VSS, Alkalinity, COD, Filtered COD, cBOD, Filtered cBOD, TKN, Filtered TKN, NH3-N, NO2-N, NO3-N, Ortho-P, Soluble Ortho-P, Total-P, and Temperature.

8. Combined RAS/WAS (grab) – During the seven day period, two grab samples from the RAS wet well at the east end of the Blower Building were taken over a 24-hour period and composited. These samples were analyzed for TSS and VSS. Daily RAS and WAS flows were also recorded.

9. Primary Sludge (grab) – During the seven day period, two grab samples were collected over a 24-hour period from the bottom of the primary clarifiers near the RAS/WAS sump using a sludge judge and composited. These samples were analyzed for TSS and VSS. Also Alkalinity, Volatile Acids, COD, Filtered COD, and Total-P were analyzed for the two days that the belt filter press operated during the study period. Daily sludge flow pumped to the digesters was also recorded.

10. Belt Filter Press Feed Sludge (grab) – Two grab samples were obtained from the sludge storage tank in the polymer and BFP feed pump room and composited for each of the two days that the belt filter press operated during the study. These samples were analyzed for TSS and VSS, COD, Filtered COD, cBOD, Filtered cBOD and Total-P. Daily digester sludge flow to the BFPs was also recorded.

11. Belt Filter Press Filtrate (grab) – Two grab samples were obtained from the belt filter press filtrate coming off the presses and composited for each of the two days that the belt filter press operated during the study. These samples were analyzed for TSS, VSS, Alkalinity, Volatile acids, COD, Filtered COD, cBOD, Filtered cBOD, TKN, Filtered TKN, NH3-N, NO2-N, NO3-N, Ortho-P, Soluble Ortho-P, and Total-P. Daily belt filter press filtrate flow was estimated and recorded.

12. Dewatered Sludge (grab) – Two grab samples were obtained from the discharge of the belt filter presses and composited for each of the two days that the belt filter press operated during the study. These samples were analyzed for TSS and VSS. Volumes of dewatered sludge was determined from the certified weigh slips obtained from the contract hauler.

WEST GOSHEN WASTEWATER TREATMENT PLANT
COMPREHENSIVE SAMPLING RESULTS - 2016

RAW WASTEWATER

DATE	FLOW (MGD)	TSS (MG/l)	VSS (%)	ALKALINITY (MG/l)	VFA (MG/l)	TEMP (° C)	ph (S.U.)	COD (MG/l)	F COD (MG/l)	FF COD (MG/l)	cBOD (MG/l)	F cBOD (MG/l)	TKN (MG/l)	F TKN (MG/l)	NH3-N (MG/l)	NO2-N (MG/l)	NO3-N (MG/l)	ORTHO-P (MG/l)	S ORTHO-P (MG/l)	TOT-P (MG/l)	CALCIUM (MG/l)	MAGNESIUM (MG/l)	D.O. (MG/l)
6-Mar	5.054	124	65.7	153		13.2	7.41	208	52.6	26.6	96.4	16.6	24.5	17.0	17.4	0.223	1.65	2.01	1.59	3.23	48.4	20.8	
7-Mar	5.225	184	87.9	144		12.8	7.33	208	49.8	31.8	83.7	14.2	30.6	22.1	19.1	0.326	1.77	2.63	2.09	4.57	49.9	21.8	
8-Mar	4.899	144	96.9	140		12.6	7.24	236	46.2	31.1	69.8	16.8	30.1	19.4	16.2	0.209	1.55	1.93	1.42	3.42	54.4	21.6	
9-Mar	4.838	176	63.0	153		13.3	7.21	312	44.2	31.9	89.8	10.9	27.9	16.9	16.6	0.231	1.57	2.07	1.40	3.60	53.5	21.3	
10-Mar	4.795	196	60.7	157		13.9	7.38	240	43.5	27.9	87.3	13.2	26.9	17.4	16.9	0.215	1.42	2.01	1.45	3.50	52.5	20.9	
11-Mar	4.649	220	93.1	152		12.5	7.29	250	46.2	35.2	92.9	10.2	27.0	21.0	20.8	0.164	1.42	2.36	1.86	3.86	53.2	21.4	
12-Mar	5.015	176	71.4	136				262	37.0	38.0	104.3	9.1	26.7	16.6	16.9	0.231	1.44	2.34	1.56	4.57	51.9	20.4	
AVERAGE	4.925	174	77.0	148		13.1	7.31	245	45.6	31.8	89	13.0	27.7	18.6	17.7	0.228	1.55	2.19	1.62	3.82	52.0	21.2	

EQUALIZATION BASIN EFFLUENT

DATE	FLOW (MGD)	TSS (MG/l)	VSS (%)	ALKALINITY (MG/l)	VFA (MG/l)	TEMP (° F)	ph (S.U.)	COD (MG/l)	F COD (MG/l)	FF COD (MG/l)	cBOD (MG/l)	F cBOD (MG/l)	TKN (MG/l)	F TKN (MG/l)	NH3-N (MG/l)	NO2-N (MG/l)	NO3-N (MG/l)	ORTHO-P (MG/l)	S ORTHO-P (MG/l)	TOT-P (MG/l)	CALCIUM (MG/l)	MAGNESIUM (MG/l)	D.O. (MG/l)
6-Mar	5.054	200	63.3	165		11.4	7.47	207	70.7		297	29.3	34.4	18.5	18.4	0.311	1.88	2.26	1.43	3.18			9.16
7-Mar	5.225	176	84.4	179			7.36	206	68.0		144	46.9	36.6	23.6	21.9	0.438	1.14	2.73	1.77	5.35			8.18
8-Mar	4.899	216	91.7	169			7.41	316	59.7		206	33.9	38.4	19.7	17.9	0.294	0.673	2.05	1.43	4.71			8.56
9-Mar	4.838	300	66.7	154			7.40	266	55.7		141	13.7	35.3	19.3	18.6	0.164	0.557	1.84	1.24	3.95			7.92
10-Mar	4.795	192	71.0	175			7.41	354	55.5		155	13.8	34.8	22.5	20.9	0.128	0.417	2.29	1.63	5.04			7.95
11-Mar	4.649	192	75.0	198			7.54	318	51.2		144	13.2	38.5	23.7	24.3	0.501	0.938	2.70	2.00	5.09			8.18
12-Mar	5.015	196	75.0	159				332	40.5		157	<60	37.6	18.1	18.7	0.452	1.11	2.34	1.48	4.98			
AVERAGE		210	75.3	171		11.4	7.43	286	57.3		178	25.1	36.5	20.8	20.1	0.327	0.96	2.32	1.57	4.61			8.33

PRIMARY CLARIFIER EFFLUENT

DATE	FLOW (MGD)	TSS (MG/l)	VSS (%)	ALKALINITY (MG/l)	VFA (MG/l)	TEMP (° F)	ph (S.U.)	COD (MG/l)	F COD (MG/l)	FF COD (MG/l)	cBOD (MG/l)	F cBOD (MG/l)	TKN (MG/l)	F TKN (MG/l)	NH3-N (MG/l)	NO2-N (MG/l)	NO3-N (MG/l)	ORTHO-P (MG/l)	S ORTHO-P (MG/l)	TOT-P (MG/l)	CALCIUM (MG/l)	MAGNESIUM (MG/l)	D.O. (MG/l)
6-Mar	5.054	44	62.5	147		12.7	7.02	153	70.3		93.0	24.8	24.0	18.7	17.6	0.372	1.06	1.81	1.61	3.03			
7-Mar	5.225	52	83.3	166			7.11	164	69.6		73.9	19.3	30.3	21.8	22.2	0.738	0.543	2.57	2.15	3.83			
8-Mar	4.899	46	100.0	162			6.99	169	82.2		76.9	68.1	25.7	18.8	16.4	0.465	1.55	1.69	1.61	2.84			
9-Mar	4.838	54	66.7	165			7.26	179	70.4		65.5	11.5	26.0	20.5	17.8	0.534	1.06	1.73	1.61	2.90			
10-Mar	4.795	44	66.7	177			7.12	135	58.0		54.6	59.9	26.9	25.9	19.9	0.088	0.261	1.85	1.64	3.06			
11-Mar	4.649	50	85.0	170			7.11	158	53.6		71.4	16.0	28.8	23.5	24.0	0.080	0.274	2.58	2.32	3.86			
12-Mar	5.015	50	70.0	157				152	49.0		68.1	12.5	24.1	18.0	19.6	0.582	0.409	2.01	1.81	3.35			
AVERAGE		49	76.3	163		12.7	7.10	159	64.7		72	30.3	26.5	21.0	19.6	0.408	0.74	2.03	1.82	3.27			

TRICKLING FILTER EFFLUENT

DATE	FLOW (MGD)	TSS (MG/l)	VSS (%)	ALKALINITY (MG/l)	VFA (MG/l)	TEMP (° F)	ph (S.U.)	COD (MG/l)	F COD (MG/l)	FF COD (MG/l)	cBOD (MG/l)	F cBOD (MG/l)	TKN (MG/l)	F TKN (MG/l)	NH3-N (MG/l)	NO2-N (MG/l)	NO3-N (MG/l)	ORTHO-P (MG/l)	S ORTHO-P (MG/l)	TOT-P (MG/l)	CALCIUM (MG/l)	MAGNESIUM (MG/l)	D.O. (MG/l)
6-Mar	5.054	30	64.0	127		10.3	7.31	111	52.9		61.3	15.3	23.9	16.2	16.0	0.390	3.50	2.16	1.85	2.94			
7-Mar	5.225	38	92.3	150			7.34	110	53.1		39.2	10.8	23.7	20.7	20.5	0.456	2.57	2.84	2.52	3.63			
8-Mar	4.899	46	82.8	150			7.39	107	51.0		59.8	27.2	21.2	18.9	17.2	0.490	2.14	2.33	2.04	3.07			
9-Mar	4.838	32	60.0	144			7.20	90.2	37.7		28.0	4.7	22.6	19.0	18.1	0.543	2.10	2.38	2.12	3.18			
10-Mar	4.795	60	65.0	157			7.25	121	47.9		40.8	13.4	25.3	20.8	19.0	0.473	1.02	2.57	2.20	3.58			
11-Mar	4.649	42	86.4	164			7.42	109	46.1		37.0	4.3	25.3	20.8	21.9	0.486	2.45	3.01	2.68	3.82			
12-Mar	5.015	48	73.7	134				112	46.9		34.6	5.7	20.9	17.0	18.2	0.491	2.38	2.53	2.23	3.31			
AVERAGE		42	74.9	147		10.3	7.32	109	47.9		43	11.6	23.3	19.1	18.7	0.476	2.31	2.55	2.23	3.36			

AERATION TANK EFFLUENT

DATE	FLOW (MGD)	TSS (MG/l)	VSS (%)	ALKALINITY (MG/l)	VFA (MG/l)	TEMP (° F)	ph (S.U.)	COD (MG/l)	F COD (MG/l)	FF COD (MG/l)	cBOD (MG/l)	F cBOD (MG/l)	TKN (MG/l)	F TKN (MG/l)	NH3-N (MG/l)	NO2-N (MG/l)	NO3-N (MG/l)	ORTHO-P (MG/l)	S ORTHO-P (MG/l)	TOT-P (MG/l)	CALCIUM (MG/l)	MAGNESIUM (MG/l)	D.O. (MG/l)
6-Mar	5.054	2930	77.3	290		11.4	6.34	55.6	15.3		4070	<60	238	1.52	2.0	0.314	20.2	12.80	1.34	>11.7			1.93
7-Mar	5.225	3450	80.2	272		12.5	6.52	-	23.5		1430	60.0	252	3.03	5.0	0.317	15.1	36.30	1.86	>55.5			0.10
8-Mar	4.899	4160	82.4	279		12.9	6.37	>1960	16.8		1800	60.0	310	3.43	4.2	0.824	11.1	31.85	2.19	58.0			0.11
9-Mar	4.838	3650	78.4	255		14.1	6.53	>3560	19.7		1200	<60	270	2.89	3.9	0.762	13.1	38.35	2.14	>79.5			0.05
10-Mar	4.795	3680	77.2	262		14.5	6.50	>3900	22.6		823	201	279	28.90	5.7	0.670	9.7	49.00	2.27	>78.1			0.11
11-Mar	4.649	3730	79.8	280		12.4	7.24	>3920	19.7		1320	<20	233	2.70	4.0	0.810	14.8	39.00	2.18	>83.8			0.16
12-Mar	5.015	3660	80.6	257				4200	18.3		1050	<60	239	3.84	3.1	0.752	17.1	>57.0	2.07	>80.9			
AVERAGE		3609	79.4	271		13.0	6.58	2128	19.4		1670	107.0	260.1	6.6	4.0	0.636	14.44	34.55	2.01	58.00			0.41

SECONDARY CLARIFIER EFFLUENT

DATE	FLOW (MGD)	TSS (MG/l)	VSS (%)	ALKALINITY (MG/l)	VFA (MG/l)	TEMP (° F)	ph (S.U.)	COD (MG/l)	F COD (MG/l)	FF COD (MG/l)	cBOD (MG/l)	F cBOD (MG/l)	TKN (MG/l)	F TKN (MG/l)	NH3-N (MG/l)	NO2-N (MG/l)	NO3-N (MG/l)	ORTHO-P (MG/l)	S ORTHO-P (MG/l)	TOT-P (MG/l)	CALCIUM (MG/l)	MAGNESIUM (MG/l)	D.O. (MG/l)
6-Mar	5.054	10	65.5	41.2		10.3		24.2	13.8		19.6	<2.0	1.46	0.83	0.52	0.091	>17.3	1.71	1.49	1.96			
7-Mar	5.225	13	76.9	33.8		12.3		31.5	16.8		6.6	8.1	3.60	2.57	3.16	0.330	15.4	2.04	1.82	2.28			
8-Mar	4.899	8	95.5	47.9		12.6		21.2	17.2		5.9	3.8	3.18	1.81	0.95	0.280	15.5	2.10	1.85	2.26			
9-Mar	4.838	6	68.0	35.1		14.2		20.8	13.2		3.7	<2.0	1.74	1.18	0.27	0.141	15.8	1.87	1.68	2.07			
10-Mar	4.795	8	70.0	41.3		14.7		20.7	17.9		15.6	3.3	2.24	1.03	0.43	0.183	16.7	1.91	1.73	2.01			
11-Mar	4.649	8	95.2	39.4		12.9		16.7	16.1		10.9	2.7	1.54	1.47	1.20	0.237	16.6	2.14	1.95	2.25			
12-Mar	5.015	8	77.3	32.6				24.0	15.1		11.5	5.2	2.21	1.61	1.32	0.287	17.1	2.17	1.94	2.33			
AVERAGE		9	78.3	38.8		12.8		23	15.7		11	4.6	2.3	1.5	1.1	0.221	16.18	1.99	1.78	2.17			

POLISHING CLARIFIER EFFLUENT

DATE	FLOW (MGD)	TSS (MG/l)	VSS (%)	ALKALINITY (MG/l)	VFA (MG/l)	TEMP (° F)	ph (S.U.)	COD (MG/l)	F COD (MG/l)	FF COD (MG/l)	cBOD (MG/l)	F cBOD (MG/l)	TKN (MG/l)	F TKN (MG/l)	NH3-N (MG/l)	NO2-N (MG/l)	NO3-N (MG/l)	ORTHO-P (MG/l)	S ORTHO-P (MG/l)	TOT-P (MG/l)	CALCIUM (MG/l)	MAGNESIUM (MG/l)	D.O. (MG/l)
6-Mar	5.054	11	65.4	34.3		10.4		24.6	14.2		4.1	2.5	3.06	0.75	0.04	0.081	>17.1	1.71	1.56	1.97			
7-Mar	5.225	9	100.0	42.8		11.9		29.0	16.8		4.5	3.8	3.04	2.08	2.72	0.180	16.0	1.98	1.79	2.20			
8-Mar	4.899	10	87.0	52.8		12.8		22.3	17.0		3.6	4.6	2.82	2.19	1.49	0.191	14.9	2.04	1.91	2.24			
9-Mar	4.838	8	70.6	37.7		15.1		18.6	9.3		3.4	4.3	1.68	1.14	0.304	0.111	16.3	1.84	1.71	2.03			
10-Mar	4.795	12	68.0	50.0		15.1		21.0	14.0		4.6	4.3	2.50	1.51	0.363	0.128	16.4	1.87	1.73	2.04			
11-Mar	4.649	8	85.0	45.9		13.3		18.5	13.3		3.4	3.2	2.18	1.37	1.05	0.196	15.9	2.05	1.91	2.22			
12-Mar	5.015	10	73.9	40.0				23.2	14.1		3.4	3.5	1.87	1.67	1.42	0.206	17.0	2.16	2.01	2.32			
AVERAGE		9.7	78.6	43.4		13.1		22	14.1		4	3.7	2.5	1.5	1.1	0.156	16.08	1.95	1.80	2.15			

COMBINED RAS AND WAS

DATE	FLOW (MGD)	TSS (MG/l)	VSS (%)	ALKALINITY (MG/l)	VFA (MG/l)	TEMP (° F)	ph (S.U.)	COD (MG/l)	F COD (MG/l)	FF COD (MG/l)	cBOD (MG/l)	F cBOD (MG/l)	TKN (MG/l)	F TKN (MG/l)	NH3-N (MG/l)	NO2-N (MG/l)	NO3-N (MG/l)	ORTHO-P (MG/l)	S ORTHO-P (MG/l)	TOT-P (MG/l)	CALCIUM (MG/l)	MAGNESIUM (MG/l)
6-Mar	4.069	10600	79.6																			
7-Mar	4.032	10000	80.1																			
8-Mar	4.108	11400	79.0																			
9-Mar	4.069	11400	79.6																			
10-Mar	4.019	11200	79.8																			
11-Mar	4.121	11900	80.4																			
12-Mar	4.071	11200	79.6																			
AVERAGE		11100	79.7																			

PRIMARY SLUDGE

DATE	FLOW (MGD)	TSS (%)	VSS (%)	ALKALINITY (MG/l)	VFA (MG/l)	TEMP (° F)	ph (S.U.)	COD (MG/l)	F COD (MG/KG)	FF COD (MG/l)	cBOD (MG/l)	F cBOD (MG/l)	TKN (MG/l)	F TKN (MG/l)	NH3-N (MG/l)	NO2-N (MG/l)	NO3-N (MG/l)	ORTHO-P (MG/l)	S ORTHO-P (MG/l)	TOT-P (MG/l)	CALCIUM (MG/l)	MAGNESIUM (MG/l)
6-Mar	0.0101	3.0	89.7																			
7-Mar	0.0101	4.0	89.8	1200	1060			160000	365000											22400		
8-Mar	0.0101	3.3	88.9																			
9-Mar	0.0101	2.5	88.5																			
10-Mar	0.0101	3.5	88.7																			
11-Mar	0.0101	3.2	89.6	900	888			65000	1170											13600		
12-Mar	0.0101	3.5	89.7																			
AVERAGE		3.3	89.3	1050	974			112500	183085											18000.00		

BELT FILTER PRESS FEED SLUDGE

DATE	FLOW (MGD)	TSS (%)	VSS (%)	ALKALINITY (MG/l)	VFA (MG/l)	TEMP (° F)	ph (S.U.)	COD (MG/l)	F COD (MG/KG)	FF COD (MG/l)	cBOD (MG/l)	F cBOD (MG/l)	TKN (MG/l)	F TKN (MG/l)	NH3-N (MG/l)	NO2-N (MG/l)	NO3-N (MG/l)	ORTHO-P (MG/l)	S ORTHO-P (MG/l)	TOT-P (MG/l)	CALCIUM (MG/l)	MAGNESIUM (MG/l)
6-Mar																						
7-Mar	0.040	5.7	74.2					569000	214		8660	109								19100		
8-Mar																						
9-Mar																						
10-Mar																						
11-Mar	0.040	4.7	71.2					732000	237		4890	54.3								23100		
12-Mar																						
AVERAGE		5.2	72.7					650500	225.5		6775	81.7										

BELT FILTER PRESS FILTRATE

DATE	FLOW (MGD)	TSS (MG/l)	VSS (%)	ALKALINITY (MG/l)	VFA (MG/l)	TEMP (° F)	ph (S.U.)	COD (MG/l)	F COD (MG/l)	FF COD (MG/l)	cBOD (MG/l)	F cBOD (MG/l)	TKN (MG/l)	F TKN (MG/l)	NH3-N (MG/l)	NO2-N (MG/l)	NO3-N (MG/l)	ORTHO-P (MG/l)	S ORTHO-P (MG/l)	TOT-P (MG/l)	CALCIUM (MG/l)	MAGNESIUM (MG/l)
6-Mar																						
7-Mar	0.105	134	72.9	1370	57.0			445	274		489.0	73	569	498	357	<0.10	8.88	51.6	39.4	47.6		
8-Mar																						
9-Mar																						
10-Mar																						
11-Mar	0.105	179	72.8	1420	86			394	255		72.3	<60	498	368	349	0.14	7.77	55.4	51.5	48.1		
12-Mar																						
AVERAGE		157	72.9	1395	72			420	264.5		281	73.0	533.5	433.0	353.0	0.140	8.33	53.50	45.45	47.85		

DEWATERED SLUDGE

DATE	AMOUNT (TONS)	SOLIDS (%)	VSS (%)	ALKALINITY (MG/l)	VFA (MG/l)	TEMP (° F)	ph (S.U.)	COD (MG/l)	F COD (MG/KG)	FF COD (MG/l)	cBOD (MG/l)	F cBOD (MG/l)	TKN (MG/l)	F TKN (MG/l)	NH3-N (MG/l)	NO2-N (MG/l)	NO3-N (MG/l)	ORTHO-P (MG/l)	S ORTHO-P (MG/l)	TOT-P (MG/l)	CALCIUM (MG/l)	MAGNESIUM (MG/l)
6-Mar																						
7-Mar	15.85	15.0	75.8																			
8-Mar																						
9-Mar																						
10-Mar																						
11-Mar	17.43	15.9	73.4																			
12-Mar																						
AVERAGE		15.5	74.6																			

DATE	WAS Flow (MGD)	RAS Flow (MGD)
6-Mar	0.019	4.05
7-Mar	0.012	4.02
8-Mar	0.018	4.09
9-Mar	0.013	4.05
10-Mar	0.009	4.01
11-Mar	0.011	4.11
12-Mar	0.021	4.05

DESCRIPTION OF SAMPLING PARAMETERS	
COD	Chemical Oxygen Demand
fCOD	Filtered COD
ffCOD	Flocculated and Filtered COD
BOD	Carbonaceous 5-day BOD
fBOD	Filtered Carbonaceous 5-day BOD
TSS	Total Suspended Solids
VSS	Volitile Suspended Solids
ALK	Alkalinity
TKN	Total Kjeldahl Nitrogen
fTKN	Filtered TKN
NH4-N	Ammonia
NO2-N	Nitrite
NO3-N	Nitrate
OP	Orthophosphate
sOP	Soluable Orthophosphate
TP	Total Phosphate

ATTACHMENT B
DMR TP RESULTS

Facility Name:	West Goshen Wastewater Treatment Plant	Month:	April/May	Year:	2016
Municipality:	West Goshen Township	Permit No.:	PA0028584	Outfall:	001
County:	Chester				

Prepared by: Herbert, Rowland and Grubic Inc.